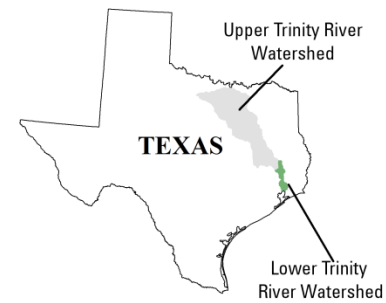
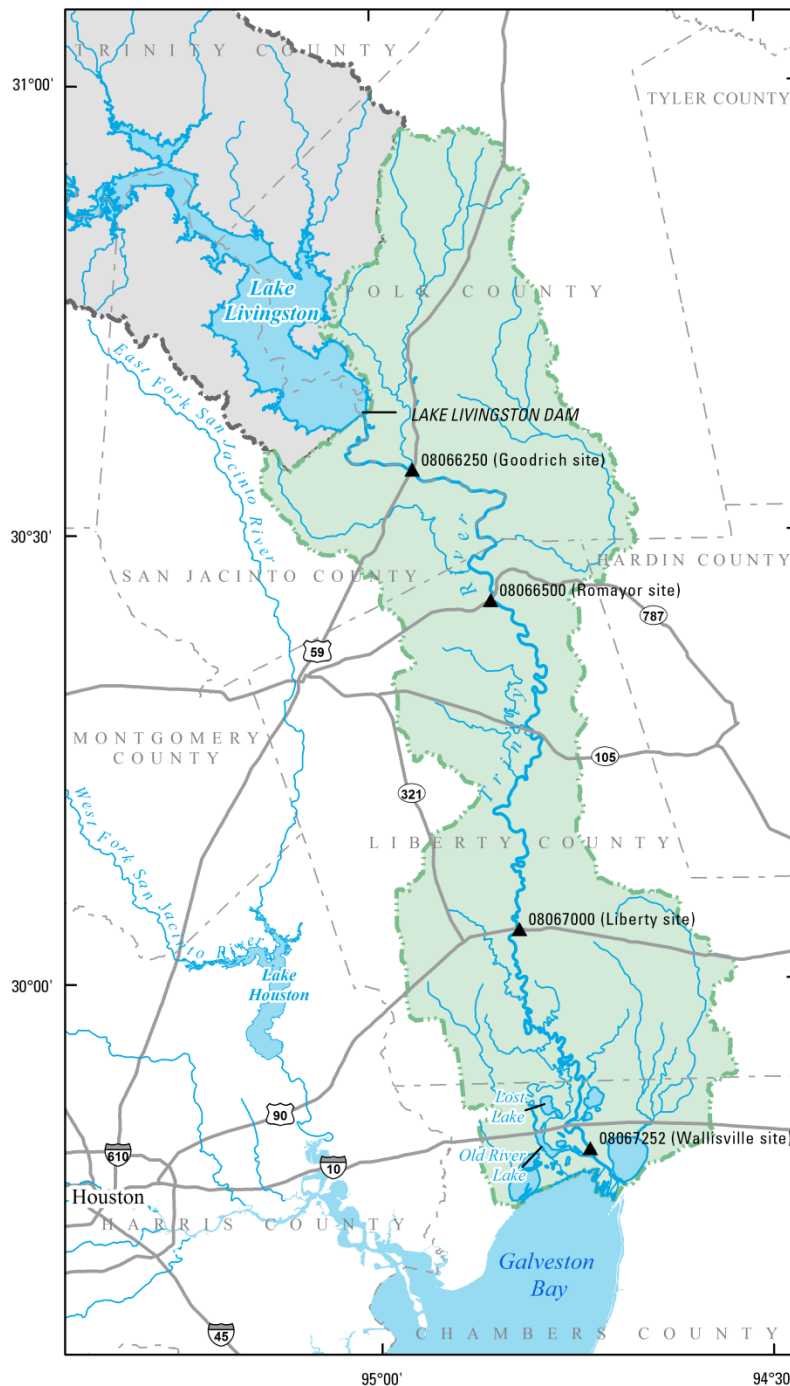


FRESHWATER INFLOW AND SEDIMENT AND NUTRIENT LOADING FROM TRINITY RIVER TO GALVESTON BAY

June 7, 2017

U.S. Geological Survey
Texas Water Science Center
Gulf Coast Program Office





- 08067252**
- EXPLANATION**
- ▲ U.S. Geological Survey streamflow-gaging station where suspended-sediment and water-quality samples were collected (table 1)
 - Lower Trinity River Watershed
 - Upper Trinity River Watershed



Base modified from U.S. Geological Survey digital data, various scales
 USA Contiguous Albers Equal Area Projection
 North American Datum 1983



PROJECT TASKS

Main task: *Analysis of streamflow and nutrient and sediment concentrations in the lower Trinity River watershed*

1. Operation and maintenance of index-velocity gage at Trinity River at Wallisville, Tex. and periodic water-quality sample collection.
2. Streamflow measurements and water-quality sample collection at Old River and Wallisville site during high flows.

WHY?

1. Gain a better understanding of how freshwater inflows, sediment, and nutrients enter Galveston Bay over a range of hydrologic conditions from the Trinity River.
2. Find a better way to predict freshwater inflow to Galveston Bay to improve hydrodynamic and water quality model predictions.
3. Improve our understanding of the role wetlands are playing in regulating flow and water quality of inflows.



LEGEND

- Flow measurement and sample
- Water quality sample only
- ▲ Flow measurement only



STREAMFLOW SUMMARY

Streamflow (in cubic feet per second) measured at:

Date	Trinity River at Liberty	Trinity River at Wallisville	Old River	Wallisville + Old River	Difference in streamflow
6/10/2015	60,000	21,600	44,300	65,900	5,900
3/17/2016	52,000	22,700	34,800	57,500	5,510
4/26/2016	32,000	17,200	7,360	24,600	-7,440
6/3/2016	81,000	22,300	62,700	85,000	4,950
10/18/2016	NA	-264	Tidal	NA	NA
12/7/2016	16,400	12,600	Tidal	NA	-3,800
4/13/2017	16,900	13,200	Tidal	NA	-3,700

GOAL: Develop a rating or lookup table to predict the flow in Old River based on streamflow measured upstream and at Wallisville.

Issues with developing a rating or lookup table to predict streamflow

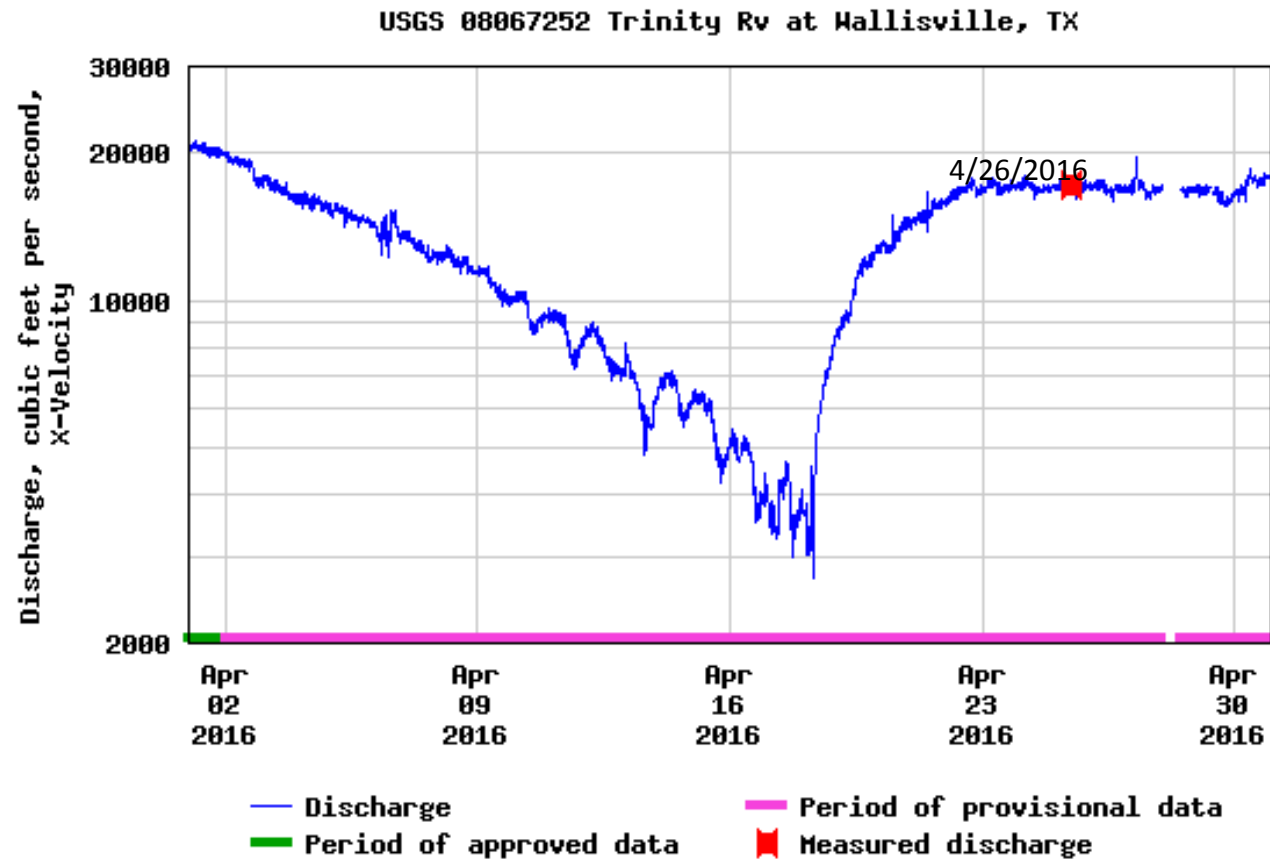
1. Conditions previous to an event
 - Saturation in wetlands may affect storage and streamflow
 - Measurements at similar streamflow, but different conditions would be ideal
2. A wider range of flows needs to be measured
 - Needed flows are between 20 and 50k cfs

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STREAMFLOW SUMMARY



Event in Apr 2016: “balance” was not achieved

STREAMFLOW SUMMARY

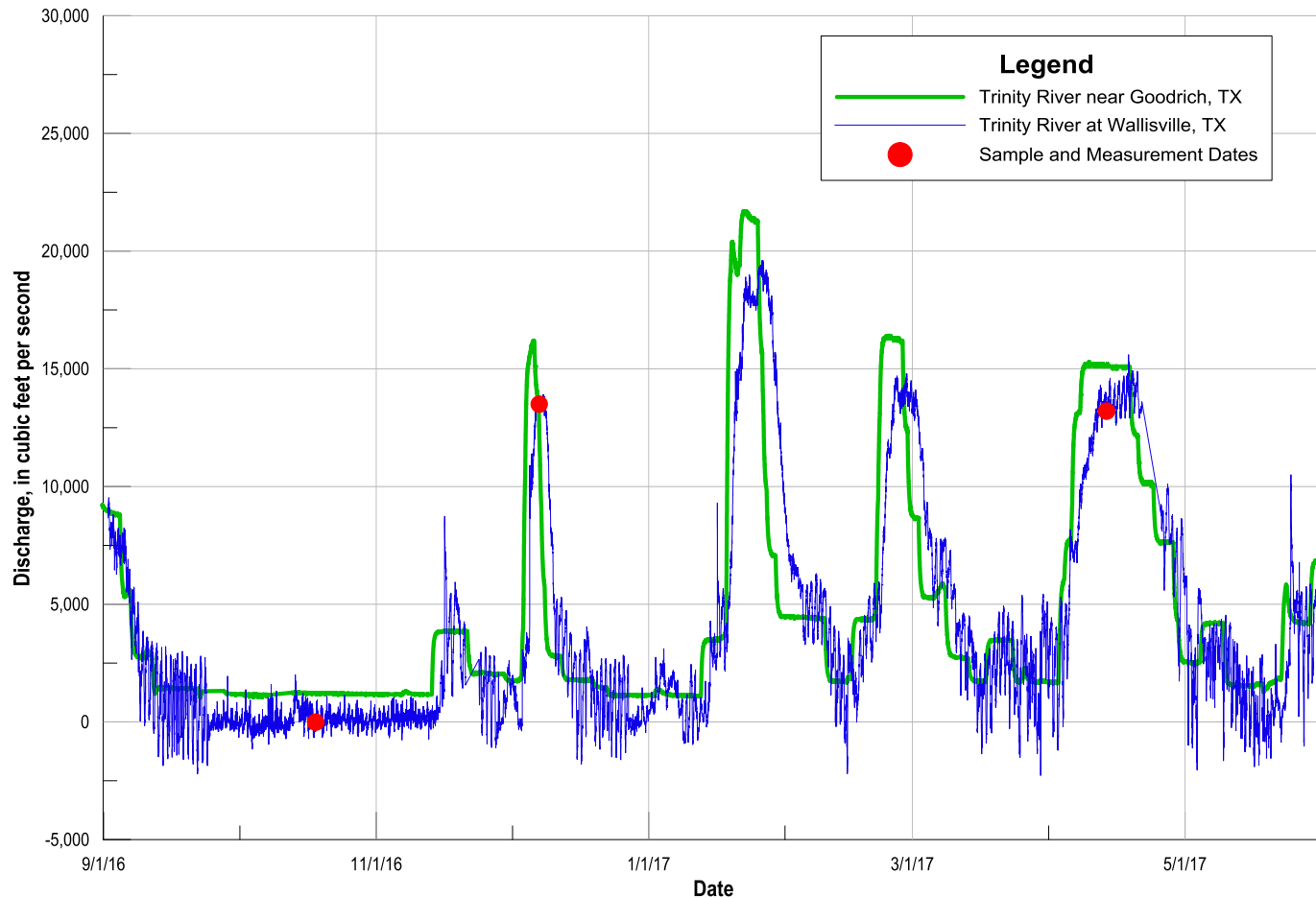
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Issues with developing a rating or lookup table to predict flows

1. Conditions previous to an event

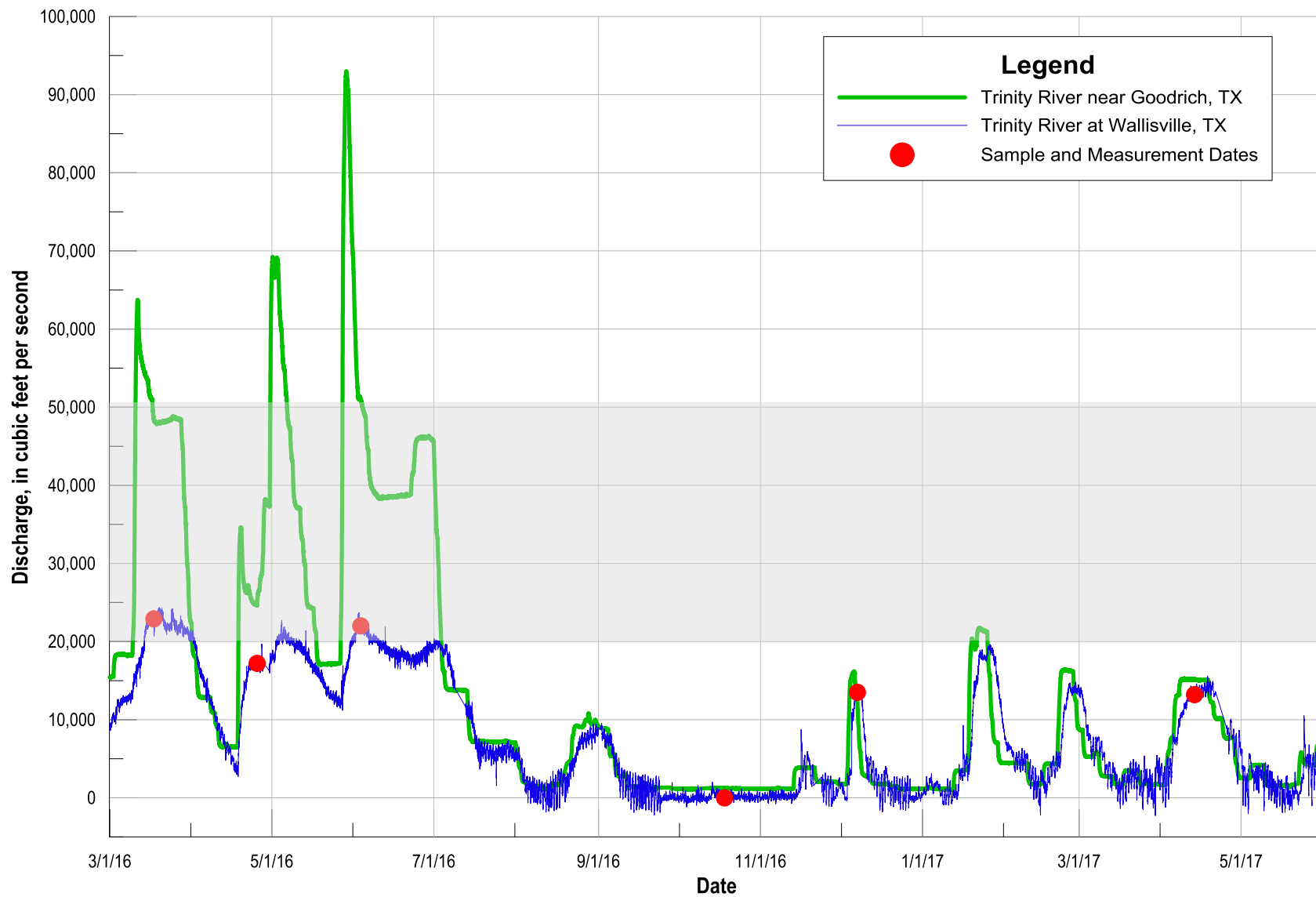
- Example:



*Provisional data, subject to revision

Issues with developing a rating or lookup table to predict flows

1. Conditions previous to an event
 - Saturation in wetlands may affect storage and streamflow
2. A wider range of flows needs to be measured:
 - Needed flows are between 20k and 50k ft³/s



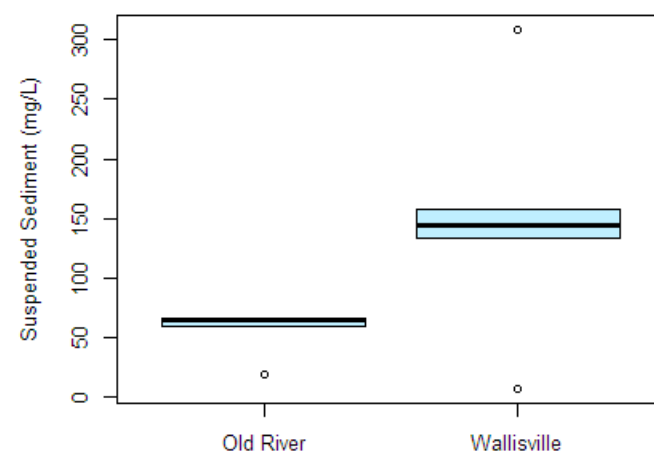
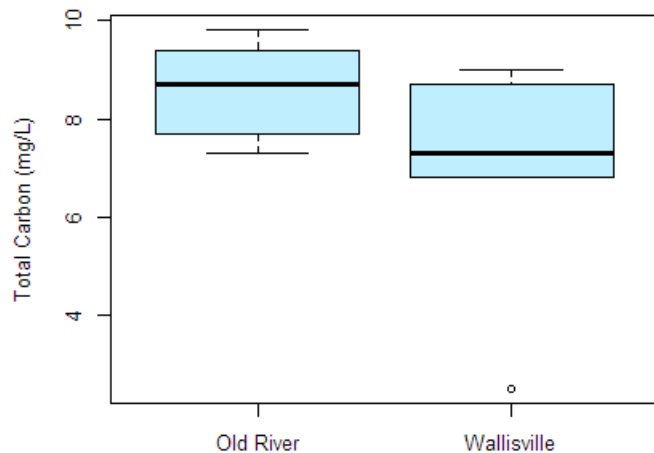
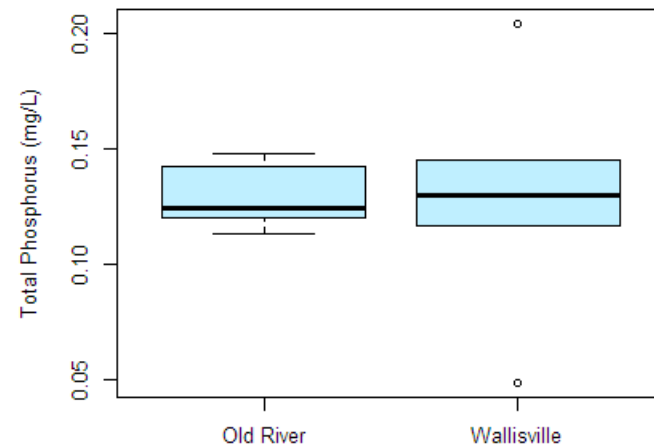
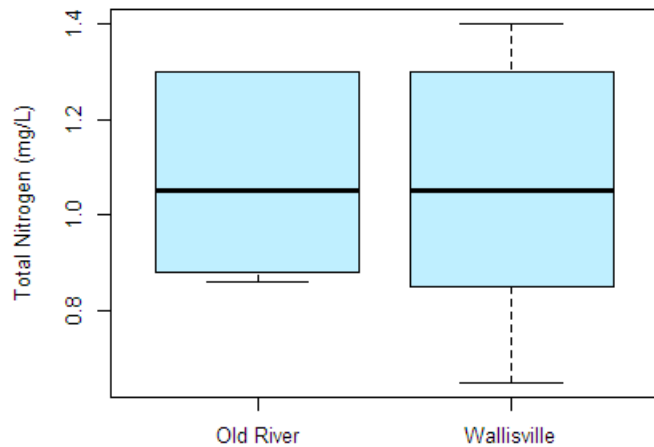
How can water quality be affected?

As water flows through wetlands the concentration of water quality constituents may change:

- *Decrease in concentrations:* Settling of suspended particles, denitrification, vegetation uptake, and retention
- *Increase in concentrations:* Input from wetland vegetation and biota

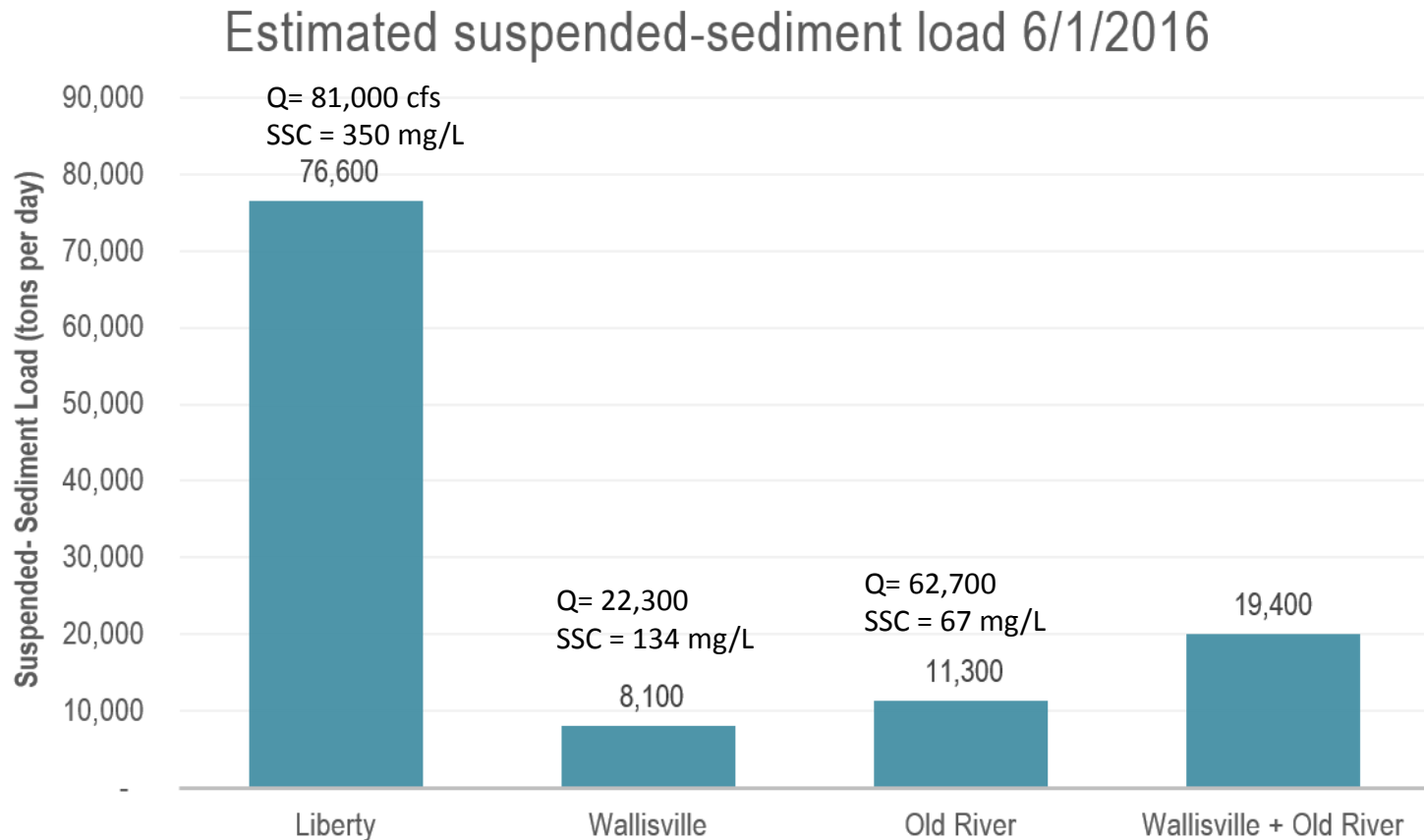
These processes may ultimately affect nutrient and sediment loading to Galveston Bay.

SELECTED WATER-QUALITY DATA



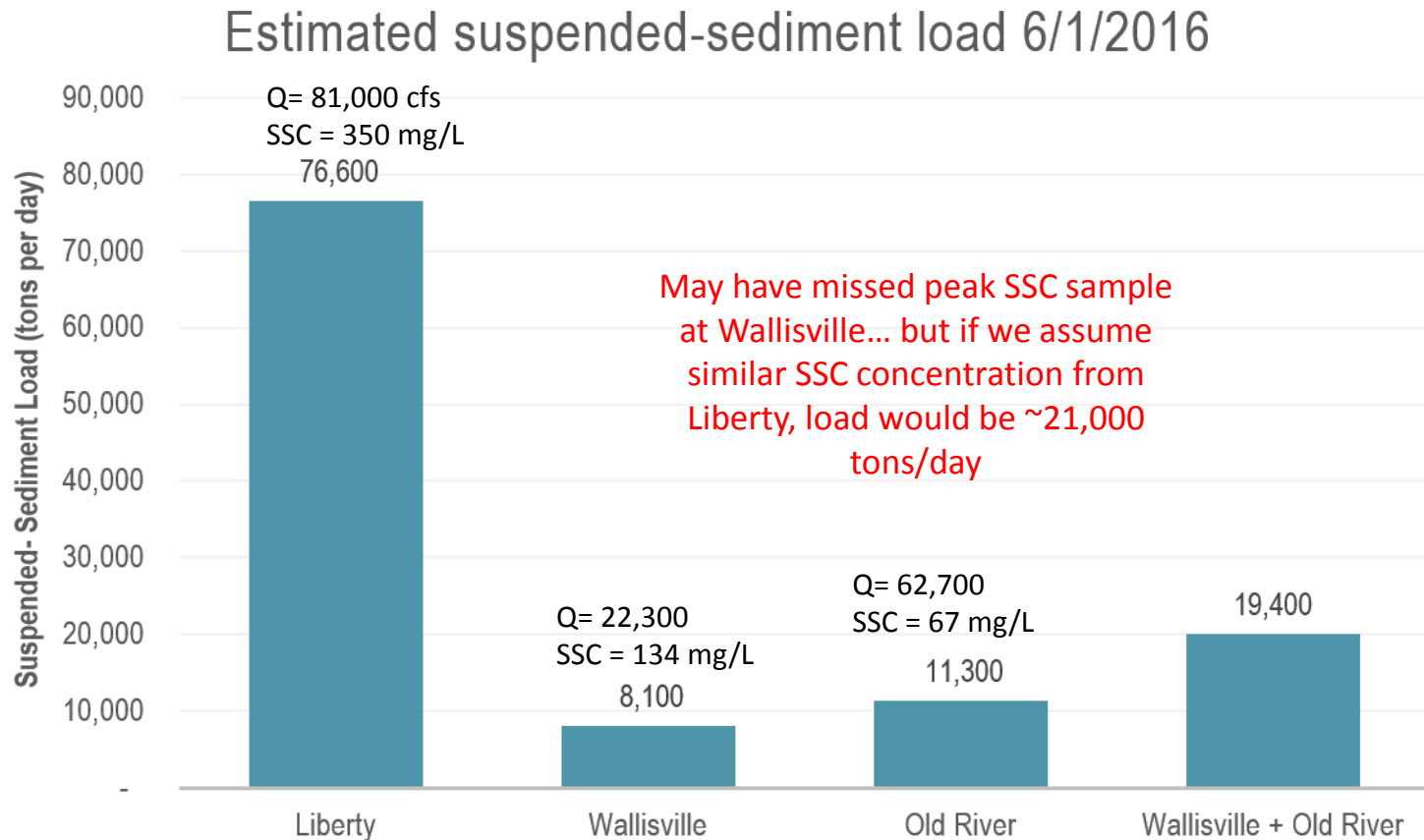
SUSPENDED-SEDIMENT LOADING

In this example, if upstream station is used to compute loading, sediment load is overestimated by almost 300%



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ACOUSTIC SURROGATE FOR SUSPENDED-SEDIMENT

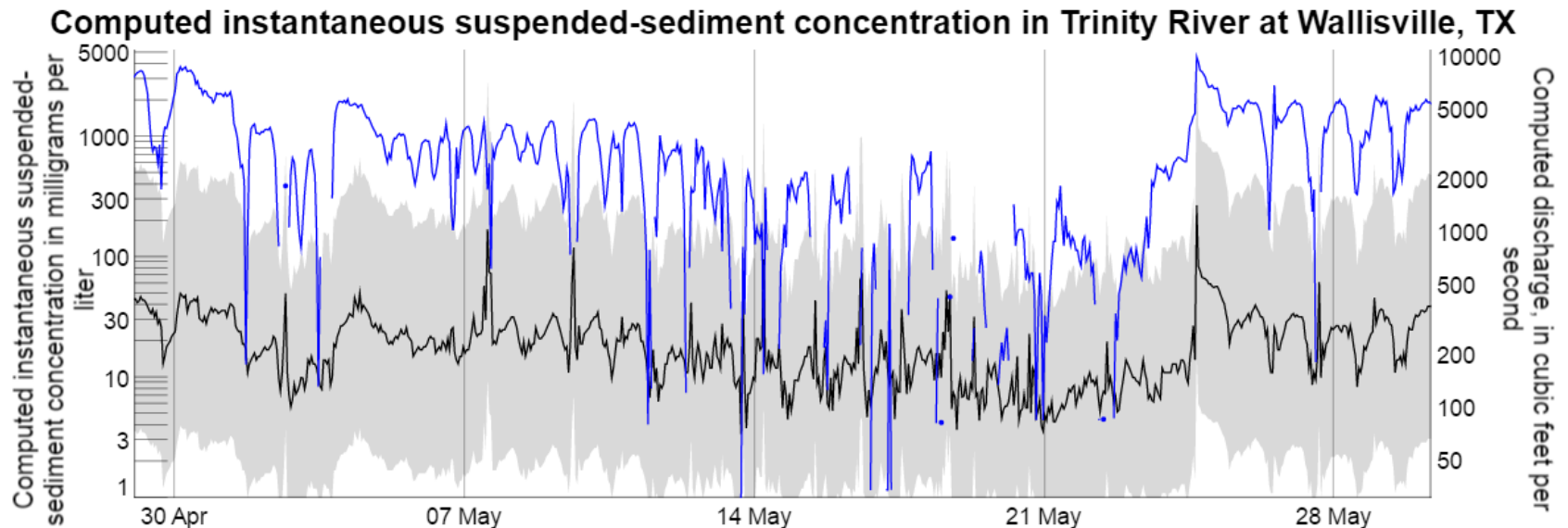


Go to NWISWeb

Constituent: Computed suspended sediment ▼ concentration ▼ hourly ▼ < Go >

Time period: Last 31 days ▼

The data used to produce this plot are **provisional** and have not been reviewed or edited. They may be subject to change.



Data pulled 05-30-17 11:09.

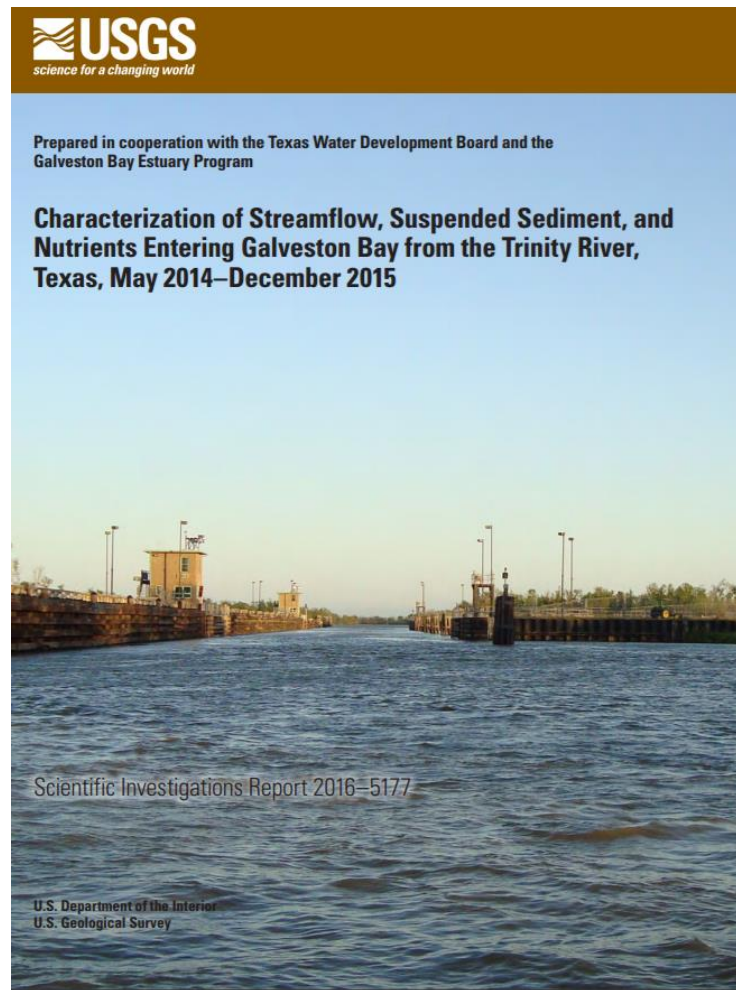
The chart is interactive: you can mouse over to highlight individual values. You can click and drag to zoom. Double-clicking will zoom you back out. Shift-drag will pan.

EXPLANATION

- Discharge
- Measured or computed water-quality constituent
- 90-percent prediction interval for computed value
- Value obtained from discrete sampling and analysis
- Load calculated using laboratory analysis and discharge
- Water-quality criteria

<https://nrtwq.usgs.gov/>

USGS REPORT



Characterization of streamflow, suspended sediment, and nutrients entering Galveston Bay from the Trinity River, Texas, May 2014–December 2015

Scientific Investigations Report 2016-5177

<https://pubs.er.usgs.gov/publication/sir20165177>

ISSUES

- Rainfall: Not enough high flow events to meet project objectives throughout the duration of project
 - No cost extension was requested and new project end date is 8/31/2018
- Scouring around Wallisville gage house - Gage was moved and meter remained in place





WHAT'S NEXT?

- Continue O&M of index-velocity streamgauge and suspended-sediment rating at Wallisville site.
- **Collect additional water-quality samples and obtain discharge measurements:**
 - **at needed flows (20-50k ft³/s) and**
 - **during events with varying antecedent conditions.**
- Evaluate methods to predict flow in lower reaches of the Trinity River.



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